



Missouri Department of Natural Resources

Missouri Natural Areas Inspection Report

2018–2019



In 1977, the Missouri Department of Natural Resources and the Missouri Department of Conservation signed a Memorandum of Understanding to establish the Missouri Natural Areas Committee. The committee is responsible for identifying, selecting, and protecting the best remaining examples of Missouri's natural features. Natural areas are defined as biological communities and geological sites that preserve and are managed to perpetuate the natural character, diversity, and ecological processes of Missouri's native landscapes. Today, since the establishment of the Missouri Natural Areas Program, the committee has designated 37 natural areas in Missouri State Parks. The smallest natural area, Pin Oak Slough Natural Area at Knob Noster State Park is 4 acres, protecting an abandoned channel slough of Clearfork Creek. The largest is a natural area owned by both MoDNR and MDC, the St. Francois Mountains Natural Area that totals 7,028 acres with 5,428 acres in MoDNR ownership centered around the rugged hills of Taum Sauk Mountain State Park.

The mission of Missouri State Parks dovetails with the goals and objectives of the Missouri Natural Areas Program. As state parks preserve Missouri's native landscapes and features, the natural areas program identifies the very best remaining examples of these landscape types. Natural areas are native landscapes and geologic features that remain intact, relatively free of damage and degradation, areas that can offer the visitor a glimpse into the historic visage of what an area resembled before European settlement began the age of extraction. Missouri state park staff are committed to protecting and preserving these areas with active management including prescribed fire, exotic species control, and other forms of ecologically sound actions.

In the 1970s and 1980s, Park Naturalists submitted annual Natural Area Inspection Forms. While much of the inspection form required a narrative to describe the condition of natural areas, there were basic categories such as sign replacement, reports of dumping household trash in our natural areas, and other threats that were tantamount to natural area management twenty and thirty years ago. Today, the threats to the natural integrity of these special areas are considerably graver and our increased knowledge of ecological stability and function is significant. With changing weather patterns resulting in major flooding, the onslaught of a growing feral hog population in Missouri, robust exotic herbaceous and woody plant species, and rampant development of natural spaces causing higher visitation to our state parks which can lead to other threats from overuse, the Natural Resource Management Program deemed it necessary to revitalize the Natural Area Inspection Forms in 2018. After significant review from members of the NRMP, select members of the Missouri Natural Areas Committee, and team members of certain field staff, the inspection form was distributed to all parks with designated natural areas for completion by December 31, 2019 in an effort to gauge the ecological status of our natural areas.

It was highly encouraged by Missouri State Parks leadership to complete the inspection forms in a collaborative manner to include park managers, interpreters, and in many cases the respective regions' Natural Resource Steward. With collaboration, there were conversations regarding ecosystem health, the identification of threats and management needs, and points of view that

undoubtedly would not have been perceived if this activity was conducted in solitude. The request to conduct this biannual inspection was generally accepted positively, with staff eager to learn more about their natural areas and encouraged that the NRMP staff and leadership were interested in the status of our most biodiverse areas of state parks. It was also communicated that each park will conduct these inspections every other year, though staff at three parks (Knob Noster, Bennett Spring, and Long Branch state parks) submitted thorough Natural Area Inspections in both 2018 and 2019. For the purposes of this report, the data from these three parks have been consolidated into one report; for example, a prescribed fire in winter 2017 that occurred at Bennett Spring Hanging Fen which was included in the 2018 report was included in the final report as a Management Activity for the timeframe of two years.

Natural Area Inspection Form Metrics

With the guiding principles of the Missouri Natural Areas Committee MOU (2009, 2013) that states the purpose of the committee is to “conserve and sustain the best remaining examples of Missouri’s natural communities and geological features as Missouri Natural Areas,” we attempted to measure how well state parks were faring. The inspections also aimed to identify and quantify threats to the sustainability of our most intact natural systems, while hopefully helping natural area managers to recognize these threats and develop a mitigation plan where possible. All of the questions posed to natural area managers will be represented below both graphically and in a narrative format. Where necessary, the ranking system from 1 to 5 will be defined under each category. In this analysis of the 2018–2019 Natural Area Inspection Forms, we will quantify the results into these primary categories:

- Current Ecological Quality or Condition
- Scientific Studies or Research Conducted
- Public Use
- Active Management
- Threats
- Degradation or Improvement of the Natural Area through Time

A brief narrative of each completed Natural Area Inspection Form will be found at the end of the report organized by natural area with additional details that could not be visualized or summarized. Just as in the natural world, each natural area is distinct, unique and has not only certain characteristics that others lack, but each natural area has its own suite of issues, both positive and negative, thereby highlighting the need for the continuance of the reporting program. It is hoped that in future reporting timeframes that park staff will reach out to seek solutions to management issues, to prioritize the preservation and sustainability of our best remaining landscapes as they are nestled in our prized state parks that harbor these special places.

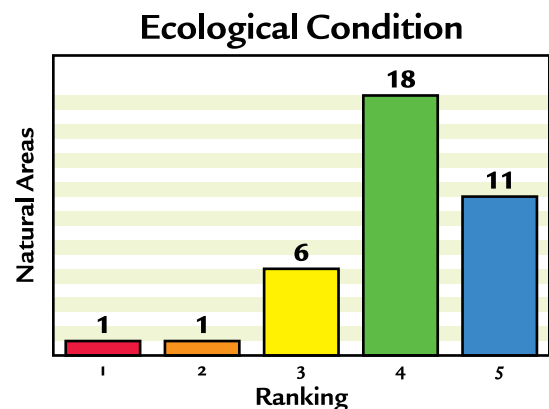
Current Ecological Quality or Condition

The narrative answers regarding the overall condition of each natural area was synthesized into a ranking rubric as follows:

1	2	3	4	5
Highly Damaged	Poor	Fair	Good	Excellent

1/Highly Damaged

Only one natural area was graded as Highly Damaged (1), the **Johnson's Shut Ins Dolomite Glade** which has been severely damaged by feral hogs and a lack of prescribed fire. According to the completed inspection form, the repetitive hog rooting damage has "essentially destroyed" the natural area which is a significant feature of the park as it is one of a few dolomite glades in an igneous-dominant park.



2/Poor

One natural area ranked in Poor (2) condition, **Babler Southwoods Hollow**, due to bush honeysuckle invasion and a lack of floral diversity. However, this natural area's defining feature is the presence of large, old growth maple trees, and in the original nomination from the 1980s, no mention was made of ground floral diversity. It is suggested by park staff to initiate a prescribed fire regime and actively manage the bush honeysuckle and deer overpopulation in an effort to restore the area's floral diversity.

3/Fair

Park staff graded six natural areas as Fair condition (3):

Natural Area	Primary Reason for Ranking
Big Oak Tree	Interruption of hydrologic regimes; excessive flooding
Grand Gulf	Sedimentation and erosion from flooding regimes
Ha Ha Tonka Karst	Gravel accretion due to flooding
Johnson's Shut Ins Fen	Sedimentation from 2005 reservoir breach
Mudlick Mountain	Feral hog damage; exotic species
Washington State Park Hardwoods	Damage to geologic features

4/Good

Overwhelmingly, park staff reported that Missouri State Park natural areas are in “Good Ecological Condition” with 18 natural areas earning the grade of 4 with all active management activities and some threat mitigation taken into account:

Bennett Spring Hanging Fen
Big Sugar Creek
Chariton River Hills
Coonville Creek
Des Moines River Ravines
Elephant Rocks

Elk River Hills
George A. Hamilton Forest
Graham Cave Glades
Lamotte Barrens Sandstone
Lincoln Hills
Locust Creek

Oumessourit
Pickle Creek
Regal Tallgrass Prairie
Roaring River Cove Hardwoods
St. Francois Mountains
Vilander Bluff

5/Excellent

Park staff ranked the remaining 11 natural areas as possessing Excellent Ecological Condition. Most of these natural areas have witnessed regular active management and threat mitigation uninterrupted for many years, such as **Ha Ha Tonka Oak Woodland**, **Coakley Hollow Fen**, and **Meramec Mosaic** natural areas. In some cases, such as with **Pin Oak Slough** and **Montauk Upland Forest** natural areas, in the past ten years park staff have taken a more active approach to management, thereby resulting in a high degree of natural integrity that either meets the nomination description or far exceeds it. Others remain in this condition, for example **Johnson’s Shut Ins** and **Orchid Valley** natural areas, due to a native quality that has not degraded through the years from a variety of threats.

Botkins Pine Woods
Coakley Hollow Fen
Ha Ha Tonka Oak Woodland
Johnson’s Shut Ins

Labarque Creek
Meramec Mosaic
Meramec Upland Forest
Montauk Upland Forest

Orchid Valley
Pin Oak Slough
Vancill Hollow

It is hoped that with ongoing management and a renewed focus on stewardship activities, many of the natural areas ranked in Good or Fair condition can improve natural quality to achieve Excellent Ecological Condition in future years.

Research and Scientific Studies in Natural Areas

Scientific research in state parks and particularly in natural areas is highly encouraged as we are always eager to gain valuable knowledge about our parks' natural history. Between 2018 and 2019, external stakeholders and MSP staff conducted scientific studies in 18 of our designated natural areas. The most commonly conducted research was general botanical surveys, followed by rare and endangered plant research and population evaluations, bird surveys (including Christmas Bird Counts), bat and other mammal research including deer spotlight counts, herpetofauna surveys, and insect population studies.

Scientific Studies/Research

18

Yes

19

No

Botanical Surveys:

Bennett Spring Hanging Fen
Coonville Creek
Graham Cave Glades
Ha Ha Tonka Karst
Ha Ha Tonka Oak Woodland
Lincoln Hills
Oumessourit
Pin Oak Slough
Regal Tallgrass Prairie
St. Francois Mountains
Vancill Hollow

Endangered Species or Species of Conservation Concern Surveys:

Ha Ha Tonka Karst
Ha Ha Tonka Oak Woodland

Lincoln Hills
Meramec Mosaic
Regal Tallgrass Prairie

Insect Surveys or Research:

Elephant Rocks
Labarque Creek
Regal Tallgrass Prairie
Vancill Hollow

Bird Surveys or Research:

Des Moines River Ravines
Lincoln Hills
Montauk Upland Forest
Regal Tallgrass Prairie
St. Francois Mountains

Herpetofaunal Surveys

Labarque Creek
Regal Tallgrass Prairie

Mammal Surveys or Research

Big Oak Tree
Coakley Hollow Fen
Ha Ha Tonka Oak Woodland
Meramec Mosaic
Regal Tallgrass Prairie

Cave Inventories

Coakley Hollow Fen
Ha Ha Tonka Karst
Vilander Bluff

Water Quality Monitoring

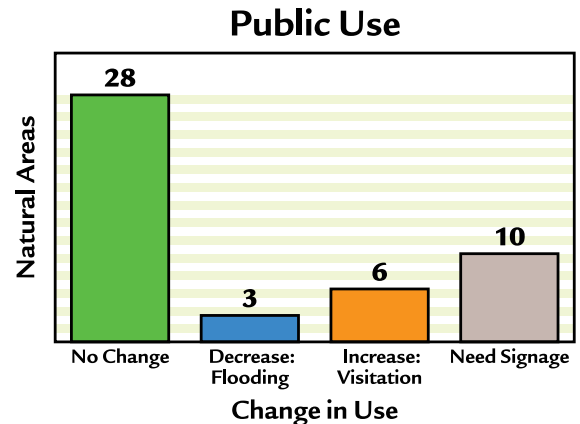
Coakley Hollow Fen
Oumessourit

Public Use of Natural Areas

29 out of 37 state park natural areas are readily accessible to park visitors directly through a network of hiking trails, roads, or by being adjacent to a designated camping area — whether a state park campground (Babler Southwoods Hollow), backpacking campground (Locust Creek — backpack camp often flooded), or a Special Use area (Pin Oak Slough). Three natural areas have decommissioned trails leading to natural areas due to flooding: Bennett Spring Hanging Fen (though the natural area

can be viewed from across Bennett Spring), Locust Creek, and Oumessourit. The remaining natural areas are remote, inaccessible for safety reasons, or visited only with the intentions of seeing the natural area. These include: Bennett Spring Hanging Fen; George A. Hamilton Forest; JSI Dolomite Glade; Lamotte Sandstone Barrens; Meramec Upland Forest; Orchid Valley; Oumessourit; and Vancill Hollow. Visitor awareness of natural area status remains relatively low in multiple cases, as natural area boundary signs have degraded through time. Natural area boundary signs are available through

the Missouri State Park Sign Shop, and as a result of the completion of the Inspection Form, park staff will be alerted to the availability of these signs. It was also reported that there may be a lack of awareness by visitors of the significance of natural area status; the need for interpretive signage explaining the natural areas program is present in 10 natural areas. Five natural area managers reported a notable increase in use of their natural areas. Montauk Upland Forest is witnessing higher visitation due to park staff leading guided hikes on the Pine Ridge Trail through the area and educating park visitors of the significance of the forested natural area. Elephant Rocks, Ha Ha Tonka Karst, Ha Ha Tonka Oak Woodland, and Lincoln Hills are experiencing higher use patterns due to awareness of the park and changing land use around park property. Missouri State Park staff regularly indicate the presence of a natural area to individuals conducting scientific research to highlight the scientific value of these special places. It is hoped that in coming months or years, with increased signage and the potential for more interpretation about the Natural Areas Program, visitor awareness of natural areas will increase.



No Change in Use

(asterisk indicates request for natural area or interpretive signage)

Babler Southwoods Hollow*
Big Oak Tree*
Big Sugar Creek
Botkins Pinewoods
Chariton River Hills
Coakley Hollow Fen
Coonville Creek
Des Moines River Ravines
Elk River Breaks Woodland
George A. Hamilton Forest*
Graham Cave Glades*
Grand Gulf*

Johnson's Shut Ins
JSI Dolomite Glade
JSI Fen
Labarque Creek*
Lamotte Sandstone Barrens
Meramec Mosaic
Meramec Upland Forest
Mudlick Mountain
Orchid Valley
Pickle Creek
Pin Oak Slough*
Regal Tallgrass Prairie
Roaring River Cove
Hardwoods*
St. Francois Mountains
Vancill Hollow*
Washington State Park

Hardwoods

Decreasing Use

Bennett Spring Hanging Fen:
Flooding erosion closed trail
Locust Creek: Flooding regularly closes trail
Oumessourit: Flooding closed boardwalk

Increasing Use

Elephant Rocks
Ha Ha Tonka Karst
Ha Ha Tonka Oak Woodland
Lincoln Hills
Montauk Upland Forest

Active Resource Management

In the early 1980s when park staff regularly submitted Natural Area Inspection Forms, most of the management of these areas included actions such as sign replacement and litter removal. Beginning in the early 1990s, and today increasingly important, management activities involve more hands-on ecosystem restoration and maintenance to combat everything from changes in hydrology to exotic species and efforts to return natural processes to our landscapes for viability. Among these activities, prescribed fire, cedar removal and hardwood thinning, and exotic species control are routinely accomplished both within and outside of our natural areas. With ever pressing threats to the sustainability of ecosystem health, active management is vital. However, it is not to diminish the importance of basic actions like routine litter removal and trail maintenance to provide natural area visitors with the best experience to these special places. Management activities occurred in 30 out of 37 natural areas between 2018 and 2019.

Active Management

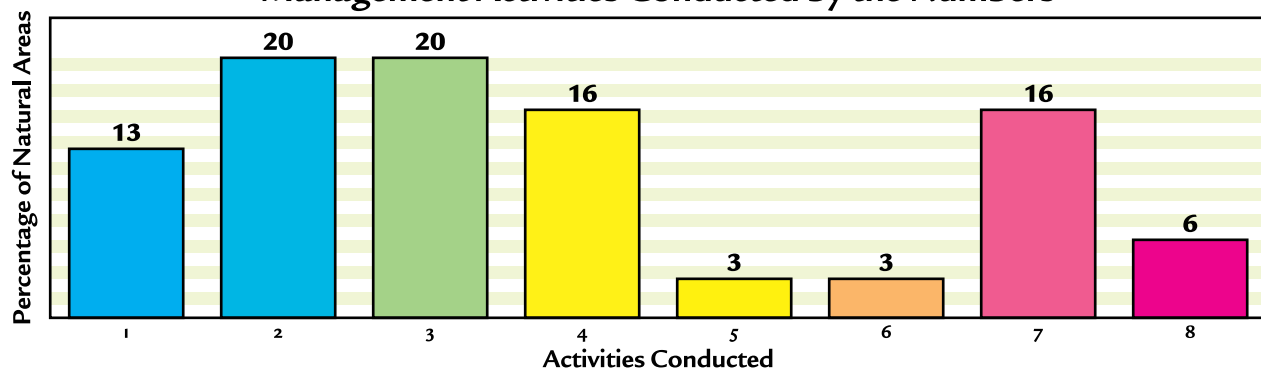
30

Yes

7

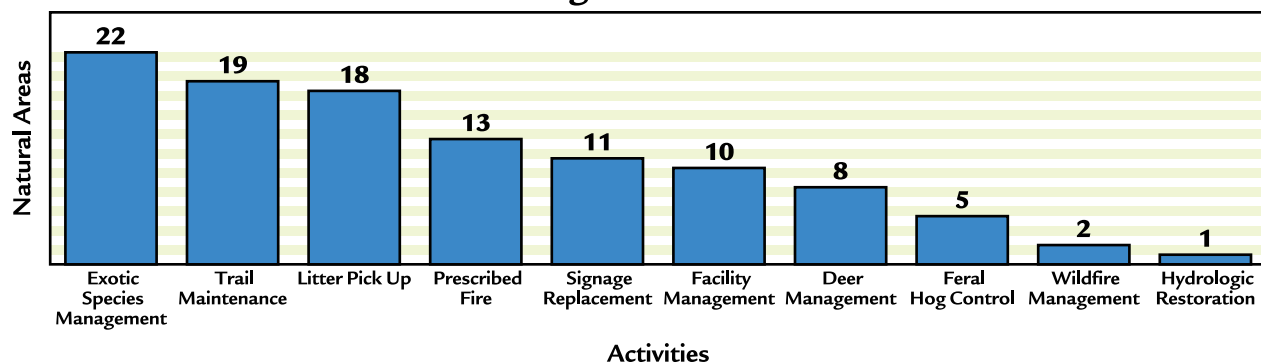
No

Management Activities Conducted by the Numbers



Listed on the inspection form were eleven primary management activities: Prescribed Fire, Deer Management, Thinning Projects, Exotic Plant Species, Feral Hogs, Hydrologic Restoration, Trail Maintenance, Litter Cleanup, Wildfire Management, Signage Replacement or Installation, and Facility Management (kiosks, benches, boardwalks, etc.), as well as Other Activity.

Management Activities



The complete spreadsheet arranged by natural area and active management category can be found in [Appendix A](#). For the purposes of this report, natural areas that witnessed ecologically significant activities are listed below arranged by activity.

Exotic Plant Species Management

Babler Southwoods Hollow
Bennett Spring Hanging Fen
Big Sugar Creek
Chariton River Hills
Coakley Hollow Fen
Coonville Creek
Des Moines River Ravines
Graham Cave Glades
Grand Gulf
Ha Ha Tonka Karst
Ha Ha Tonka Oak Woodland
Johnson's Shut Ins Fen
Labarque Creek
Lamotte Sandstone Barrens
Lincoln Hills
Locust Creek
Meramec Mosaic
Montauk Upland Forest
Mudlick Mountain
Oumessourit

Pin Oak Slough
Regal Tallgrass Prairie

Prescribed Fire

Bennett Spring Hanging Fen
Chariton River Hills
Coakley Hollow Fen
Ha Ha Tonka Oak Woodland
Lincoln Hills
Meramec Mosaic
Montauk Upland Forest
Mudlick Mountain
Oumessourit
Pickle Creek
Regal Tallgrass Prairie
St. Francois Mountains
Washington State Park
Hardwoods

Deer Management

Babler Southwoods Hollow
Bennett Spring Hanging Fen
Chariton River Hills

Ha Ha Tonka Oak Woodland
Locust Creek
Meramec Upland Forest
Montauk Upland Forest
Pin Oak Slough

Thinning Projects

Chariton River Hills
Coakley Hollow Fen
Graham Cave Glades
Labarque Creek
Lincoln Hills
Regal Tallgrass Prairie
Vancill Hollow

Feral Hog Management

Johnson's Shut Ins
Johnson's Shut Ins Fen
Mudlick Mountain
Regal Tallgrass Prairie
St. Francois Mountains

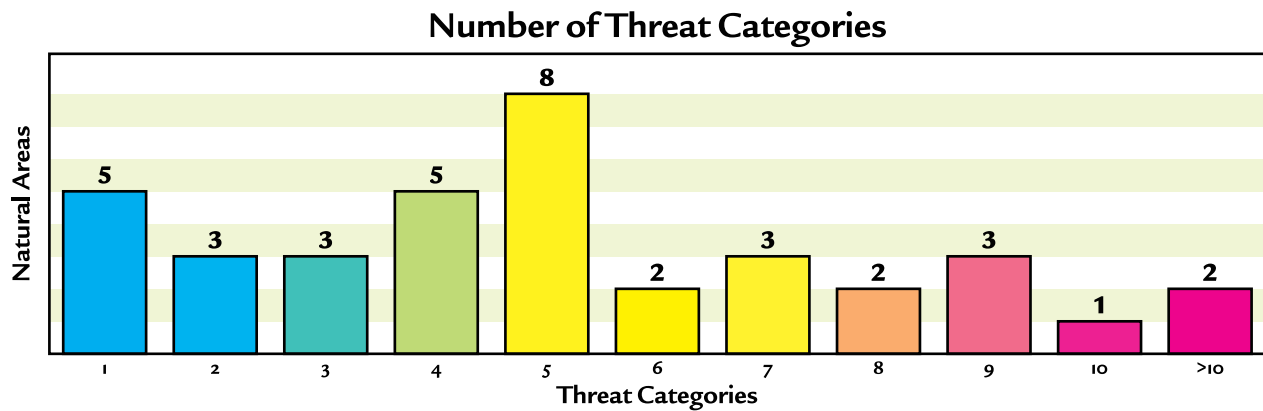
Hydrologic Restoration

Big Oak Tree

With the presence and spread of exotic herbaceous and woody plant species, feral hog populations, as well as a rising deer overpopulation issue throughout the state, it is a positive indication that park staff are participating in these vital activities to mitigate the threats in our natural areas.

Threats

As most of the management activities in natural areas are conducted routinely or as a response to a threat to natural quality, we identified 28 threat categories as they pertain to natural areas. The first 15 threats are either naturally occurring events that resulted in potential negative impacts, or even external threats like exotic species. The second category includes 13 threats related to unauthorized use such as plant or animal collecting and vandalism to caves, among others. The number of natural areas listing each of these as a threat will be separated by the two primary threat categories, Natural Resource and Use related. Considering that the most frequently conducted



management activity in our natural areas was exotic species control, Exotic Herbaceous Plants ranked as a primary threat in 24 natural areas. While the inspection form did not include a scale of the threat, littering—whether a stray water bottle or something more intense—ranked as the top use-related threat. However, in a shift from the 1980s and 1990s inspection forms, park staff reported the ecological threats more often than unauthorized use issues. The ranking tables below illustrates the number of natural areas that listed the Natural Resource and Use Related threats in their inspection forms:

Natural Resource Related Threats

Exotic Herbaceous Plants	24
Exotic Woody Plants	17
Flooding	11
Erosion	9
Streambank Erosion	8
Deer/Beaver Overpopulation (Animal Population Changes)	7
Plant Composition Changes	7
Water Level Changes	7
Feral Hogs (Exotic Animal Populations)	6
Siltation	5
Wind Damage	4
Largescale Tree Mortality	3
Lack of Prescribed Fire	2
Ice Storm Damage	1
Geologic Changes	1
Other—Herbicide Drift	1

Use Impacts

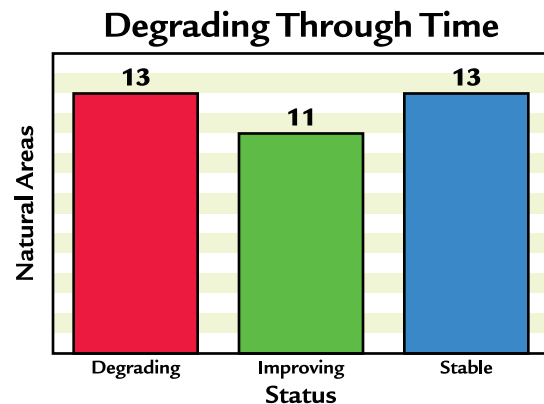
Littering	15
Unauthorized Trails	10
Unauthorized ORV or other Vehicle Use	8
Unauthorized Campfires	8
Collecting	6
Vandalism to Natural Features	6
Vandalism to Facility	5
Poaching	4
Unauthorized Bicycle Use	3
Dumping	2
Vandalism to Caves	2
Vandalism to Signs	1
Unauthorized Equestrian Use	2
Unauthorized Rock Climbing	2
Vandalism to Signs	1

With the understanding of the most commonly reported threats, and some beyond human control such as ice storm damage, the NRMP will be able to better target mitigation efforts to prevent further degradation. It is elucidating that park staff are actively managing natural area resources to help mitigate the onslaught of exotic species, recognizing deer overpopulation

issues, and altogether serving as stewards to these 37 special areas. It is almost to be expected that a visitor use issue state park system-wide, the creation of unauthorized trails, is occurring also in our natural areas. This leads not only to park visitors becoming disoriented or lost, but also excessive trampling of vegetation and, in severe cases, the establishment of well-trod paths to sensitive natural features that cannot often handle excessive visitation.

Degrading Through Time

The last question on the inspection form came requesting a narrative: “Is the natural area improving or degrading through time?” This question examines all of the factors regarding management, threats and natural quality sustainability in our designated natural areas. Considering the time lapse between the completion of inspection forms in the early 1990s and 2018–2019, as well as the addition of many more natural areas since that time, this question asked for an overall pulse, a simple gauging of ecological health. It was reported that the natural quality in 11 of our natural areas is improving through time, with more prescribed fire, deer management, and exotic species control serving as the most common activities in these 11 natural areas. 13 natural areas were listed as degrading through time due to lack of fire, exotic species control, erosion, deer overpopulation and other threats listed above. The remaining 13 natural areas are remaining in a stable natural area quality due, again, to continued management and attention by park staff to maintain these areas.



Degrading through Time

Babler Southwoods Hollow
Big Oak Tree
Des Moines River Ravines
Elk River Hills
Graham Cave Glades
Ha Ha Tonka Karst
Johnson's Shut Ins Dolomite Glade
Johnson's Shut Ins Fen
Locust Creek
Mudlick Mountain
Oumessourit
St. Francois Mountains
Vilander Bluff

Stable through Time

Botkins Pine Woods
Chariton River Hills
Coonville Creek
Elephant Rocks
George A. Hamilton Forest
Johnson's Shut Ins
Labarque Creek
Lamotte Sandstone Barrens

Improving through Time

Bennett Spring Hanging Fen
Big Sugar Creek
Coakley Hollow Fen
Grand Gulf
Ha Ha Tonka Oak Woodland
Lincoln Hills
Meramec Mosaic
Montauk Upland Forest
Pin Oak Slough
Regal Tallgrass Prairie
Vancill Hollow

Appendix A:

Summaries of Natural Area Inspection Forms

Babler Southwoods Hollow, 17 acres. Designated 1978. Edmund E. Babler State Park: This small natural area of large, old growth trees is witnessing issues related to deer overpopulation and a bush honeysuckle invasion. It is suggested by park staff that the area is included in a prescribed fire program to help control bush honeysuckle seedlings and potentially encourage characteristic flora to grow.

Bennett Spring Hanging Fen, 5 acres. Designated in 1982. Bennett Spring State Park: Park staff have initiated active fire and exotic species control in the natural area in recent years. The small fen itself, on average 1 acre, is beginning to see multiflora rose and Eastern red cedar invasion, and access to the fen is difficult due to the wet conditions. However, the whole area is improving with the recent efforts

Big Oak Tree, 940 acres. Designated in 1977. Big Oak Tree State Park: Challenges of managing Big Oak Tree include a greatly altered hydrologic regime due to surrounding farmlands and excessive flooding. The park staff, working with external partners and MoDNR, are developing a hydrology project to restore Grassy Pond, a historic swamp in the natural area. Planning for this project continues in 2020.

Big Sugar Creek, 56 acres. Designated in 1979. Cuivre River State Park: With an aggressive garlic mustard management program, Big Sugar Creek continues to protect a high quality stream rich with uncommon fauna and intact streambanks, though recent flooding events are causing erosion issues.

Botkins Pine Woods, 30 acres. Designated in 1981. Hawn State Park: Also located in the Whispering Pines Wild Area, Botkins Pine Woods is included in a regular fire regime and a narrow trail allows access to hikers. This area is relatively remote with no exotic species problems.

Chariton River Hills, 429 acres. Designated in 2005. Long Branch State Park: This prairie-savanna natural area remains in good condition though in recent years, potentially due to deer overpopulation issues, the herbaceous component is declining throughout the area. Park staff regularly manage the woody brush that is slowly invading the area and maintain a regular fire regime.

Coakley Hollow Fen, 1,776 acres. Designated in 1982. Lake of the Ozarks State Park: Recent expansion of the natural area in 2016 included multiple high quality natural communities and larger fens. Recent brush removal has occurred in the namesake fen and the prescribed fire regime for the expanded natural area continues on a regular schedule.

Coonville Creek, 49 acres. Designated in 1979. St. Francois State Park: The regular prescribed fire program and aggressive exotic species management has helped to maintain this high quality fen community. Erosion from the historic ATV use continues to be an issue but the area is slowly healing.

Des Moines River Ravines, 40 acres. Designated in 1978. Battle of Athens State Historic Site: In the past 5 years, the infestation of Emerald Ash Borer has decimated the natural area's ash canopy, leaving many gaps in the canopy of this mesic forest. Park staff continue to address the garlic mustard population, but the spring floral displays remain healthy and vibrant.

Elephant Rocks, 7 acres. Designated in 1978. Elephant Rocks State Park: This geologic natural area remains in good condition though the interpretive braille panels continue to be vandalized. Efforts are being made to restore the biological community with a new fire program initiated in the past few years.

Elk River Breaks Woodland, 1,600 acres. Designated in 2000. Big Sugar Creek State Park: The natural area is also included in the Elk River Hills Wild Area due to its scenic natural features and ruggedness. To maintain openness of these steep woodlands, regularly occurring prescribed fire is necessary. However, the fire regime has not continued on schedule in the past ten years and the area is now overgrown with woody brush. Plans are underway to reinvigorate the fire program here.

George A. Hamilton Forest, 40 acres. Designated in 1983. Cuivre River State Park: The natural area preserves one of the oldest mature tree stands in the park. Exotic species are not an issue here, though in the absence of fire park staff are witnessing some maple encroachment in the uplands.

Graham Cave Glades, 82 acres. Designated in 1989. Graham Cave State Park: The glades of the natural area remain rich with native flora, though there has been some cedar encroachment in recent years due to an interruption of the fire regime. The Missouri Native Plant Society visited the natural area in 2019 and added new vascular plant species to the park checklist.

Grand Gulf, 60 acres. Designated in 1986. Grand Gulf State Park: This geologic natural area remains in good condition, and in recent years park staff have initiated a successful prescribed fire program in the surrounding woodlands. The gulf continues to flood during heavy rain events, and the Missouri Geologic Survey conducted dye tracing in the past ten years to validate the previous tests that link the gulf to Mammoth Spring in Arkansas.

Ha Ha Tonka Karst, 70 acres. Designated in 1981. Ha Ha Tonka State Park: The natural area includes Ha Ha Tonka Spring which is currently suffering from a significant road gravel accretion problem as the gravel courses through the karst system beginning with River Cave. A new aggressive exotic species was discovered in the Colosseum, and annual treatment of this, called *Veronica hederifolia*, continues to protect the spring wildflower display there.

Ha Ha Tonka Oak Woodland, 2,995 acres. Designated in 1981. Ha Ha Tonka State Park: The natural area includes most of the parks' exceptional quality woodlands and glades which continue to be under a regular prescribed fire program. Most of the threats to this large natural area are related to visitor use and overuse.

Johnson's Shut Ins, 180 acres. Designated in 1978. Johnson's Shut Ins State Park: The geologic feature natural area that serves as the park's namesake continues to be in good condition and delights park visitors from all over the United States.

Johnson's Shut Ins Dolomite Glade, 18 acres. Designated in 1984. Johnson's Shut Ins State Park: The feral hog infestation in the St. Francois Mountains region has decimated the natural area. The glade is located outside of a prescribed fire unit and has not witnessed a fire in many years. Rooting and destruction by feral hogs remains the primary threat to this natural area.

Johnson's Shut Ins Fen, 8 acres. Designated in 1983. Johnson's Shut Ins State Park: Following the December, 2005 reservoir breach, the natural area underwent significant restoration efforts. In recent years, beavers have moved into the area allowing ponding to occur. Soil hummocks with sedges are developing but the natural area does not resemble the JSI Fen at the time of designation when it was a forested fen.

Labarque Creek, 1,966 acres. Designated in 2010. Don Robinson State Park: This joint MDC-DNR owned natural area maintains exceptional condition since the time of designation. The prescribed fire and thinning programs have continued to invite native flora to respond. Unauthorized trails on fragile soils to sensitive features remains a primary threat, but overall the DNR-owned portion of the natural area is faring well.

Lamotte Sandstone Barrens, 81 acres. Designated in 1989. Hawn State Park: Located near walk-in campsites, it was discovered that ORV trails and unauthorized campsites have been established in the natural area. Proper mitigation of these issues has occurred, and park staff are keeping a close watch on a private landowner's property that is infested with the exotic Tree of Heaven which may move into the natural area. This natural area at Hawn SP receives little public use.

Lincoln Hills, 1,872 acres. Designated in 1998. Cuivre River State Park: This landscape-scale natural area in the Lincoln Hills region of Missouri maintains high quality woodlands and harbors healthy populations of Running Buffalo Clover. Park staff are continuing the prescribed fire program and exotic species regime. In 2019, the park was awarded a Missouri Bird Conservation Initiative grant to help with bush honeysuckle removal in the area.

Locust Creek, 330 acres. Designated in 1979. Pershing State Park: Threatened by private land activities occurring upstream of the natural area throughout the watershed, the natural area is witnessing significant and ongoing heavy sedimentation. Park staff continue working with hydrologists, MoDNR, and USACE staff to address these changes that are occurring in what remains one of the few unchannelized prairie streams in north Missouri.

Meramec Mosaic, 831 acres. Designated in 2002. Meramec State Park: The woodlands and glades continue to improve with a stringent prescribed fire program. There is very little public access to the area's glades, though in recent years park staff have witnessed the evidence of rock flipping in search of herpetofauna or arachnids, and a curious incidence of plant digging on glades.

Meramec Upland Forest, 461 acres. Designated in 1980. Meramec State Park: This area is comprised of much acreage located outside of the Copper Hollow Burn Unit, burned in 2018.

Portions of the natural area that witnessed fire have responded well to management. Park staff continue to monitor for ATV trespass, unauthorized campsites, and exotic species including bush honeysuckle which remains a priority species for removal in the natural area.

Montauk Upland Forest, 40 acres. Designated in 1979. Montauk State Park: Much of the natural area is a mesic forest with large boulder ravines and a thriving wildflower display each spring. In the pine uplands, park staff in recent years have implemented a rigorous exotic species program. It has been suggested that NRMP staff consider proposing an expansion of this natural area to include the pine woodlands that are treated with prescribed fire.

Mudlick Mountain, 1,370 acres. Designated in 1981. Sam A. Baker State Park: This large and complex area has seen firelines installed multiple times but due to weather conditions the area has not been burned in recent years. It is on schedule to be burned in 2020–2021 fire season. Feral hogs and the spread of Japanese stiltgrass into the uplands are being closely monitored to mitigate degradation of this natural area.

Orchid Valley, 120 acres. Designated in 1977. Hawn State Park: This deep sandstone canyon region of the park remains in very good condition. Full of ferns, liverworts, and lush spring wildflower displays, this area of Hawn SP sees very little to no visitation. As a very remote part of the region, there has been little to no evidence of exotic species encroachment or feral hog signs.

Oumessourit, 300 acres. Designated in 1981. Annie and Abel Van Meter State Park: The natural area's rigorous prescribed fire program continues to be effective at keeping the marsh in an open condition. However, park staff are working with MSP Planning and Development to create a stormwater system that will alleviate some of the sediment moving into the marsh and causing woody shrubs to develop. Sedimentation of the marsh continues to be the greatest issue park staff face in this natural area.

Pickle Creek, 58 acres. Designated in 1979. Hawn State Park: Pickle Creek is a primary feature of Hawn State Park and witnesses significant visitation. While the stream remains in exceptional condition with islands of large ferns and endemic native vegetation, unauthorized trails and unauthorized camping and campfire rings are the primary threats to the area. The Pickle Creek corridor was included in a prescribed fire in 2018.

Pin Oak Slough, 4 acres. Designated in 1978. Knob Noster State Park: Located adjacent to a Special Use camping area, Pin Oak Slough only sees the occasional camper passing through. In recent years, park staff have initiated a comprehensive exotic species eradication project throughout the park and focusing on the natural area as a priority. Consecutive managed deer hunts are steadily helping the natural area recover from years of overbrowsing. Additional photo stations were created in the natural area to track changes in flora and hydrology.

Regal Tallgrass Prairie, 3,646 acres. Designated in 1981. Prairie State Park: An aggressive woody brush removal project and invasive species regime began several years ago. Park staff

continue the strict prescribed fire regime that maintains the floral diversity of the natural area. Bison culling continues, and in the past few years park staff sold off the park's elk herd.

Roaring River Cove Hardwoods, 120 acres. Designated in 1978. Roaring River State Park: This natural area possesses large old growth trees and is also located in the Roaring River Hills Wild Area. Designated for the mature canopy which continues to grow, this small portion of the wild area sees very little use but maintains the signature tree structure.

St. Francois Mountains, 7, 028 acres. Designated in 1996. Taum Sauk Mountain State Park: Jointly owned by MoDNR and MDC, the two agencies in a consortium with APHIS and other agencies have continued an aggressive feral hog eradication program in the natural area. Electric wire fencing is placed around federally endangered plant locations in the natural area, and regular vegetation monitoring occurs throughout the region. Feral hogs are the primary threat to the integrity of this landscape-scale natural area.

Vancill Hollow, 300 acres. Designated in 1977. Trail of Tears State Park: Active management including prescribed fire, exotic species control and hardwood thinning continues to occur here as it has for the past ten to twenty years. This biologically rich natural area is improving through time because of the management taking place.

Vilander Bluff, 206 acres. Designated in 1996. Onondaga Cave State Park: The signature feature of Vilander Bluff remains unchanged, though unauthorized trails lead visitors to sensitive areas such as caves. Park staff are working to develop a sustainable trail system and have initiated a prescribed fire program in recent years.

Washington State Park Hardwoods, 68 acres. Designated in 1985. Washington State Park: The area is known for the lush spring wildflower display, and park staff have been assiduous at keeping the exotic species in check within the natural area. The primary threats to the integrity of this area is vandalism to natural features and flooding by the Big River which brings in new exotic species such as Japanese hops.

Cover photo: Ha Ha Tonka Oak Woodland Natural Area, 2995 acres.

Appendix B: Natural Area Inspection Report 2018-2019

	Babler Southwoods Hollow	Bennett Spring Hanging Fen	Big Oak Tree	Big Sugar Creek	Botkins Pine Woods	Chariton River Hills	Coakley Hollow Fen	Coonville Creek	Des Moines River Ravines	Elephant Rocks
Current Ecological Condition	2	4	3	4	5	4	5	4	4	4
Scientific Studies	N	Y	Y	N	N	N	Y	Y	Y	N
Public Use Change	N*	Y-D*	N*	N	N	N	N	N	N	Y=I
N=no change										
Y-D=decreasing	*Need signage	*trail closed due to erosion	*Need signage							
Y-I=Increasing										
Active Management¹	Y-3	Y-5	Y-2	Y-1	N	Y-7	Y-7	Y-3	Y-2	N
¹ Prescribed Fire		Y				Y	Y			
Litter Cleanup	Y	Y				Y	Y	Y		
Hydrologic Restoration			Y							
Thinning						Y	Y			
Deer Management	Y	Y				Y				
Facility Management							Y			
Exotics	Y	Y		Y		Y	Y	Y	Y	
Feral Hogs										
Trail Maintenance		Y				Y	Y	Y	Y	
Wildfire Management										
Signage			Y			Y	Y			
Other										
Threat Categories²	5	5	5	4	1	3	9	5	5	1
² Unauthorized Campfires								Y		
Poaching							Y			
ORV Use						Y	Y			
Off-Trail Equestrian										
Collecting									Y*	
Littering	Y	Y						Y		
Dumping										
Unauthorized Bicycle Use										
Unauthorized Trails										
Unauthorized rappelling										
Vandalism to Caves										
Vandalism to Facility										Y
Vandalism to Natural Features							Y			
Vandalism to Signs										
Unauthorized Vehicle Use										
Exotic Herbaceous Species	Y	Y		Y	Y	Y	Y	Y	Y	
Exotic Woody Species	Y			Y				Y	Y	
Exotic Animal Populations										
Plant/Animal Populations (Composition and/or Size)						Y*	Y*			
Ice Damage										
Water Level Changes			Y							
Largescale Tree Mortality									Y	
Flooding		Y	Y	Y			Y	Y		
Geologic Changes										
Deer Overpopulation	Y	Y								
Wildfire										
Erosion							Y			
Streambank Erosion		Y		Y			Y			
Wind Damage									Y	
Siltation							Y			
Lack of Prescribed Fire	Y		Y							
Other			4. Herbicide drift							
						*Woody encroachment on grasslands	*Benthic invertebrates declining because of siltation		*Ginseng collecting	
Degrading through Time?										
I=Improving; S=Stable	Y	N-I	Y	N-I	N-S	N-S	N-I	N-S	Y	N-S

	Elk River Breaks Woodland	George A. Hamilton Forest	Graham Cave Glades	Grand Gulf	Ha Ha Tonka Karst	Ha Ha Tonka Oak Woodland	Johnson's Shut-Ins	JSI Dolomite Glade	JSI Fen	Labarque Creek	Lamotte Barrens Sandstone
Current Ecological Condition	4	4	4	3	3	5	5	1	3	5	4
Scientific Studies	N	N	Y	N	N	Y	Y	N	N	Y	N
Public Use Change	N	N*	N	N*	Y=I*	Y=I*	N	N	N	N*	N
N=no change Y-D=decreasing Y-I=Increasing		*Need signage		*Need signage	*Growing awareness/par kwide visitation increasing	*Growing awareness/par kwide visitation increasing				*Needs signage	
Active Management¹	N	N	Y-3	Y-3	Y-2	Y-7	Y-4	N	Y-4	Y-4	Y-1
¹ Prescribed Fire						Y					
Litter Cleanup			Y	Y	Y	Y	Y		Y		
Hydrologic Restoration											
Thinning			Y							Y	
Deer Management						Y					
Facility Management						Y			Y		
Exotics			Y	Y	Y	Y			Y	Y	Y
Feral Hogs							Y		Y		
Trail Maintenance				Y		Y	Y			Y	
Wildfire Management											
Signage						Y	Y			Y	
Other											
Threat Categories²	2	2	5	9	4	19	8	1	4	4	5
² Unauthorized Campfires						Y					Y
Poaching						Y					Y
ORV Use						Y					Y
Off-Trail Equestrian						Y					
Collecting						Y					
Littering			Y	Y		Y	Y		Y		Y
Dumping	Y										
Unauthorized Bicycle Use						Y					
Unauthorized Trails				Y	Y	Y	Y			Y	
Unauthorized rapelling							Y				
Vandalism to Caves					Y	Y					
Vandalism to Facility				Y			Y				
Vandalism to Natural Features				Y		Y				Y	
Vandalism to Signs						Y					
Unauthorized Vehicle Use						Y					
Exotic Herbaceous Species			Y	Y	Y	Y				Y	Y
Exotic Woody Species	Y	Y	Y	Y		Y				Y	
Exotic Animal Populations							Y	Y	Y		
Plant/Animal Populations (Composition and/or Size)		Y*							Y*		
Ice Damage											
Water Level Changes									Y		
Largescale Tree Mortality											
Flooding				Y	Y	Y					
Geologic Changes			Y*								
Deer Overpopulation						Y					
Wildfire						Y					
Erosion				Y		Y	Y				
Streambank Erosion							Y				
Wind Damage			Y			Y					
Siltation				Y							
Lack of Prescribed Fire											
Other											
		*Maple encroachment	*Road construction causing geologic changes						*Beaver populations continue to grow		
Degrading through Time? I=Improving; S=Stable	Y	N-S	Y	N-I	Y	N-I	N-S	Y	Y	N-S	N-S

	Lincoln Hills	Locust Creek	Meramec Mosaic	Meramec Upland Forest	Montauk Upland Forest	Mudlick Mountain	Orchid Valley	Oumessourit	Pickle Creek	Pin Oak Slough
Current Ecological Condition	4	4	5	5	5	3	5	4	4	5
Scientific Studies	Y	Y	N	Y	Y	N	N	Y	N	Y
Public Use Change	Y=I*	Y=D*	N	N	Y=I*	N	N	Y=D*	N	N*
N=no change	*Increasing parkwide visitation from growing urban center	*Increasing flood events on backpack trail causing more trail closure events			*More focus from park staff for guided hikes in NA. Need signage			*Closure of boardwalk trail from erosion and increased flooding		*Need signage; near Special Use camp and request interpretive signage
Y=D=decreasing										
Y-I=increasing										
Active Management¹	Y-8	Y-6	Y-2	Y-2	Y-7	Y-7	N	Y-4	Y-1	Y-2
¹ Prescribed Fire	Y		Y		Y	Y		Y	Y	
Litter Cleanup	Y	Y			Y	Y		Y		
Hydrologic Restoration										
Thinning	Y									
Deer Management		Y		Y	Y					Y
Facility Management	Y	Y			Y	Y				
Exotics	Y	Y	Y		Y	Y		Y		Y
Feral Hogs						Y				
Trail Maintenance	Y	Y		Y	Y	Y		Y		
Wildfire Management	Y	Y								
Signage	Y				Y	Y				
Other										
Threat Categories²	9	11	5	3	3	10	1	8	2	6
² Unauthorized Campfires				Y		Y			Y	
Poaching										
ORV Use			Y	Y						
Off-Trail Equestrian	Y									
Collecting	Y									
Littering	Y	Y						Y		Y
Dumping										
Unauthorized Bicycle Use						Y		Y		
Unauthorized Trails								Y	Y	Y
Unauthorized rappelling										
Vandalism to Caves										
Vandalism to Facility		Y								
Vandalism to Natural Features						Y				
Vandalism to Signs										
Unauthorized Vehicle Use					Y					
Exotic Herbaceous Species	Y	Y	Y		Y	Y		Y		Y
Exotic Woody Species	Y	Y	Y	Y		Y				Y
Exotic Animal Populations						Y				
Plant/Animal Populations (Composition and/or Size)	Y*							Y*		
Ice Damage						Y				
Water Level Changes		Y				Y		Y		Y
Largescale Tree Mortality		Y				Y				
Flooding	Y	Y								
Geologic Changes										
Deer Overpopulation		Y	Y		Y					Y
Wildfire	Y									
Erosion		Y	Y					Y		
Streambank Erosion	Y	Y	Y							
Wind Damage						Y				
Siltation		Y						Y		
Lack of Prescribed Fire										
Other										
	*Sassafras/sumac invasion of prairies							*Woody encroachment in marsh from siltation		
Degrading through Time? I=Improving; S=Stable	N-I	Y	N-I	N-S	N-I	Y	N-S	Y	N-S	N-I

Regal Tallgrass Prairie		Roaring River Cove Hardwoods	St Francois Mountains	Vancill Hollow	Vilander Bluff	Washington State Park Hardwoods
4	Current Ecological Condition	4	4	5	4	3
Y	Scientific Studies	N	Y	Y	N	N
N	Public Use Change	N*	N	N*	Y=I*	N
	N=no change Y-D=decreasing Y-I=Increasing	*Need signage		*Need signage	*Public comment for better access; in progress	
Y-8	Active Management ¹	N	Y-3	Y-1	Y-3	Y-4
Y	¹ Prescribed Fire		Y			Y
Y	Litter Cleanup					Y
	Hydrologic Restoration					
Y	Thinning			Y		
	Deer Management					
Y	Facility Management				Y	Y
Y	Exotics					
Y	Feral Hogs		Y			
Y	Trail Maintenance		Y		Y	Y
Y	Wildfire Management					
	Signage				Y	
	Other					
7	Threat Categories ²	1	7	7	4	6
	² Unauthorized Campfires		Y		Y	
	Poaching		Y			
Y	ORV Use		Y			
	Off-Trail Equestrian					
Y	Collecting		Y			Y
Y	Littering					Y
	Dumping			Y		
	Unauthorized Bicycle Use					
	Unauthorized Trails			Y	Y	
	Unauthorized rappelling				Y	
	Vandalism to Caves					
	Vandalism to Facility					Y
	Vandalism to Natural Features					Y
	Vandalism to Signs					
	Unauthorized Vehicle Use					
Y	Exotic Herbaceous Species	Y	Y			Y
Y	Exotic Woody Species					
Y	Exotic Animal Populations Plant/Animal Populations (Composition and/or Size)		Y		Y*	
	Ice Damage					
	Water Level Changes			Y		
	Largescale Tree Mortality					
	Flooding			Y		Y
	Geologic Changes					
	Deer Overpopulation					
	Wildfire					
Y	Erosion			Y		
	Streambank Erosion			Y		
	Wind Damage					
	Siltation			Y		
	Lack of Prescribed Fire					
	Other					
					*Maple encroachment on ridgetops	
N-I	Degrading through Time? I=Improving; S=Stable	N-S	Y	N-I	Y	N-S